is given by

$$\hat{b}(n) = \arg\max_i \int_{nT}^{(n+1)T} r(t)s_i(t)dt$$

(6.42)

You may not have seen the

$$\arg\max_i$$

notation before. ***max_i***{***i***, ·} yields the maximum value of its argument with respect to the index

$$i. \arg\max_i$$

equals the value of the index that yields the maximum. Note that the precise numerical value of the integrator's output does not matter; what does matter is its value relative to the other integrator's output.

Let's assume a perfect channel for the moment: The received signal equals the transmitted one. If bit 0 were sent using the baseband BPSK signal set, the integrator outputs would be

$$\int_{nT}^{(n+1)T} r(t)s_0(t)dt = A^2T$$
$$\int_{nT}^{(n+1)T} r(t)s_1(t)dt = \left(A^2T\right)$$

(6.43)

If bit 1 were sent,

$$\int_{nT}^{(n+1)T} r(t)s_0 dt = -(A^2T)$$
$$\int_{nT}^{(n+1)T} r(t)s_1 dt = A^2T$$

(6.44)

Exercise 6.16.1

Can you develop a receiver for BPSK signal sets that requires only one multiplier-integrator combination?

Exercise 6.16.2

What is the corresponding result when the amplitude-modulated BPSK signal set is used? Clearly, this receiver would always choose the bit correctly. Channel attenuation would not affect this correctness; it would only make the values smaller, but all that matters is which is largest.